TU 112

Last advances and perspectives for a better risk assessment of the tropical uses of Protection Plant Products in France

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Issues

- Risk assessment (RA) of water contamination required prior registration of Plant Protection Product (PPP) in French overseas territories is currently conducted using tools and guidance documents established for EU context.
- The specificities of agro-pedo-climatic conditions in these tropical regions [1, 2] require to define specific tools and methodologies as allowed by the EC regulation 1107/2009.
- This poster presents the work in progress about :

1 Solutions for deriving some pesticide's properties appropriate for tropical soils from EU endpoints

48 scientific publications & EU regulatory endpoints)

Database

		Adsorption coeff. (Kf [1])[2] Degradation rate (K)[3]		
		pH	...[4]	value
Temperate soils		7.2	...	152
			...	...
Tropical soils		5.6	...	134
		...	...	...

[1] Freundlich Kf (median value for all1/n = 0.92)
[2] 25 active substances & 13 tropical soils, n=325
[3] 12 active substances & 10 tropical soils, n=120
[4] chemical and soil properties, experiment. conditions

Aim: determine the **potential contribution of the specific properties of tropical soils** (as a whole) **on** both variables of interest (**K & Kf**) regardless of the other known soil properties and conditions

Multiple linear regressions (MLR)

Software R **v. 2.13.0**

Independent variable: difference between individual value (K or Kf) and the mean obtained for temperate soil

Explanatory variable: all additional Information

(chemical properties, pestic. type, soil org. carbon, pH, soil class, texture, soil geograph. origin, T° , water content) Data normalized using standard classification (*e.g.* USDA), pedotransfer functions (*e.g.* pH-KCl) and FOCUS normalization method (*e.g.* 20 ° C and pF2)

- ✓ **influence of tropical soil on K or Kf highlighted mainly for acidic compounds**
- ✓ **for most substances, EU endpoints considered provisionally acceptable for the RA of PPP in FR tropical condition (by using current regulatory tools)**
- ✓ **database & analysis to be improved to conclude about regulatory rules**

Example of significant relationships provided by the MLR for adsorption coefficient

Chemical properties	Variables	Coefficient	p value (signif. level)
Acidic compounds	Tropical origin	43.09	0.0012 ***
	pH : Tropical origin	8.66	0.0008 ***
	OC : Tropical origin	2.27	$2.2\ 10^{-5}$ ***

*** P < 0.001

2 Agro-pedo-climatic specificities to consider in PPP transport modeling

- realistic worst-case weather scenarios following a simplified approach based on the vulnerability of water compartment need to be defined (range of rainfall: 900-10000 mm)
- at first step, four soil /crop situations (2 soils: andosol and nitisol and 2 crops: banana and sugar cane) will be considered in the next future
- specific solutions to describe the water transfer for vertic soil (partly cultivated with sugar cane) still need to be found
- preferential flow needs to be considered
- specific rainfall redistribution by crops canopy for banana [2] and process of re-infiltration and hypodermic transport leading to two distinct contamination mechanisms (event-dominated / stabilized contamination phase) [3]

3 Models under development (surface and subsurface flow) : principles and framework

- A model representing surface and subsurface flow of water and pesticides in banana crops on tropical volcanic soils is currently under development and test
  - ✓ heterogeneous overland flow at the field scale due to intense stemflow, considered
  - ✓ preferential flow processes during percolation considered
  - ✓ hysteretic sorption processes stemflow by preferential flow processes during percolation considered
  - ✓ established by experiments conducted in the Caribbean Island Guadeloupe [2, 4]
  - ✓ based on a recent numerical approach for solving Richard's flow equation [5] and on a rainfall/runoff modelling approach developed for catchments covered by banana crops [6]

Schedule for a 2-year research project (2012-2014) dedicated to the development of specific modelling solution

Dates	April 2013		June 2013	April 2014	December 2014
Actions	Short analysis of the vulnerability of SW and GW water (following FOCUS approach)	Definition of realistic worst-case weather, crop and soil datasets	Development of software code	Sensitivity study	Communication & availability of the friendly interface

Reference list

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[6] Charlier, J.B., Moussa, R., Cattan, P., Cabidoche, Y.-M. , Voltz, M. 2009. Modelling runoff at the plot scale taking into account rainfall partitioning by vegetation: application to stemflow of banana (Musa spp.) plant. Hydrology and Earth System Sciences, 13, 2151–2168.

Conclusions

1. **Deriving pesticide's properties from EU studies considered provisionally acceptable for the RA of PPP in tropical condition**
2. **EU endpoint however do not supersede any experimental evidence supplied with tropical soils**
3. **Modeling solution to assist RA of the use of PPP in FR oversea territories planned for the end of 2014**

BERLIN 6th SETAC World Congress 2012